DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the electrode wiring substrate which used an electrode wiring material and this.
[0002]
[Description of the Prior Art] In recent years, the active matrix liquid crystal display constituted considering the TFT (it abbreviates to TFT hereafter) formed using the amorphous silicon (it abbreviates to a-Si hereafter) film as a switching element is expected as what can realize a large area, highly minute, and a high-definition and cheap panel display.
[0003] Since the total extension of address wiring increases by leaps and bounds inevitably when it constitutes the panel display of a large area, a resisted part which address wiring has increases, delay resulting from a resisted part of address wiring of the gate pulse given to a switching element becomes remarkable, and there is a problem of normal control of liquid crystal becoming impossible. For this reason, as wiring materials, such as address wiring, resistivity fully needs to use low material. Now, aluminum (aluminum) is used as such wiring of low resistance, or a material of an electrode.
[0004] However, when aluminum is used as an electrode wiring material, a hillock and round-head bulging may arise in the electrode and wiring which were formed. Moreover, as for aluminum, corrosion resistance also has the fault of being bad. Therefore, a reliable element cannot be obtained even if it produces the electrode wiring substrate which formed various elements, using aluminum which has the above-mentioned problem as an electrode wiring material. Thus, aluminum is a material which gives various restrictions in an electrode or the formation process of wiring, and is not a desirable electrode wiring material.
[0005] this invention is made in view of this point, it fully has low resistivity, and, moreover, handling aims at offering an easy electrode wiring material and offering the reliable electrode wiring substrate using this electrode wiring material.
[0006]
[Means for Solving the Problem] Invention of the 1st of this invention offers the electrode wiring material which makes a principal component at least one sort chosen from Mo and W, and is characterized by including the alloying element chosen from the group which consists of Ar of 0.0003 atom % - pentatomic %, Kr of 0.0003 atom % - 3 atom %, and Xe of 0.0003 atom % - 3 atom %.
[0007] Moreover, invention of the 1st of this invention offers the electrode wiring material which makes W a principal component, or makes a principal component W and at least one sort chosen from Mo and Cr, and is characterized by including the alloying element chosen from the group which consists of Ar of 0.0003 atom % - pentatomic %, Kr of 0.0003 atom % - 3 atom %, and Xe of 0.0003 atom % - 3 atom %.
[0008] In the electrode wiring substrate which comes to form electrode wiring on a glass substrate, the aforementioned electrode wiring consists of at least one sort of metals chosen from Mo and W, and invention of the 2nd of this invention offers the electrode wiring substrate characterized by the rate of the lattice constant of the aforementioned material to the lattice constant of the bulk state of the material in the aforementioned electrode wiring being less than **3%.
[0009] Moreover, in the electrode wiring substrate which comes to form electrode wiring on a glass substrate, the aforementioned electrode wiring consists of W or W, and at least one sort of metals chosen from Mo and Cr, and invention of the 2nd of this invention offers the electrode wiring substrate characterized by the rate of the lattice constant of the aforementioned material to the lattice constant of the bulk state of the material in the aforementioned electrode wiring being less than **3%.
[0010] In the 1st invention, Ar added to a basis metal is set as 0.0003 atom % - pentatomic %. Moreover, ****** Kr is set as a basis metal at 0.0003 atom % - 3 atom %. Moreover, ****** Xe is set as a basis metal at 0.0003 atom % - 3 atom %. This is because membrane formation becomes difficult industrially with it being under the minimum of the addition of each atom and the resistivity of the film obtained when the upper limit was exceeded becomes high rapidly. The more desirable addition of Ar is 0.001 atom % - 1 atom %. The more desirable addition of Kr is 0.0003 atom % - 1 atom %, and especially the desirable addition of Kr is 0.0003 atom % - 0.5 atom %. The addition of more desirable Xe is 0.001 atom % - 1 atom %.
[0011] In the 2nd invention, it is desirable that electrode wiring is formed by the sputtering method. The film which has high adhesion force by this can be formed on the substrate of a large area.
[0012] In the 1st and 2nd invention, it is desirable that Ti is added by the principal component. Thereby, adhesion force can be raised and acid resistance can be improved. When basis metals are at least one sort of metals chosen from Mo and W in the 1st

and 2nd invention, it is desirable that the content of W or Mo is ten atom % - 95 atom %. This is because the margin of the sputtering conditions from which the film which has low resistivity as the content of W or Mo is within the limits of ten atom % - 95 atom % is obtained becomes large. As an electrode wiring substrate of this invention, the substrate in which the liquid crystal display and the semiconductor device were formed etc. can be mentioned.

[0013]

[Embodiments of the Invention] The electrode wiring materials concerning this invention differ in W, Mo, etc. which are the conventional electrode wiring material, and are characterized by including Ar, Xe, or Kr by the predetermined content in material. Thereby, while low resistivity is fully shown, the corrosion resistance which was excellent compared with aluminum etc. is securable.

[0014] Electrode wiring can be formed using such an electrode wiring material by forming membranes by sputtering in gas atmosphere, such as Ar, Kr, and Xe. In this case, it is necessary to adjust various membrane formation conditions, such as power of a sputtering system, and a pressure.

[0015] Especially, Kr and Xe have fully large atomic weight compared with Ar, and can give high energy on the occasion of membrane formation. For this reason, the film which has the good crystal structure can be formed and resistivity can be reduced. Thus, since the film which has the good crystal structure can be formed, it also becomes possible to set up the lattice constant of the material which constitutes the film almost equally to the lattice constant in the bulk state of the material. The rate of the lattice constant of the material which constitutes the film to a lattice constant [in / the bulk state of material / that a lattice constant is almost equal] here means that it is less than **1% preferably less than **3%.

[0016] Although Mo and W may mainly be formed in single phase when forming electrode wiring using the electrode wiring material of this invention, you may form membranes with refractory metals, such as these alloys, Cr(s), etc. Thus, by alloying, low resistance-ization can be attained more for electrode wiring.

[0017] Next, based on the experimental result by this invention persons, this invention is explained in detail. First, the relation between the content of Kr, Xe, and Ar in the electrode layer which formed membranes using the electrode wiring material concerning this invention, and the influence which it has on an electrode layer is explained.

[0018] Using the load lock formula sputtering system of single wafer processing, 200 degrees C and membrane formation power were set as 10kW, inter-electrode distance was set as 5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.9Pa of Ar gas **, MoW containing Mo of 65 atom % was made to deposit on a glass substrate, and the MoW alloy film (sample 1) of 300nm of thickness was formed. In addition, when Ar content in the film of this sample 1 was measured by fluorescence-X-rays equipment RIX-1000 (physical science electrician business company make, tradename), it was 0.3 atom %. Moreover, when the resistivity of this sample 1 was measured, it was 17micro ohm-cm.

[0019] Moreover, using the load lock formula sputtering system of single wafer processing, 200 degrees C and membrane formation power were set as 10kW, inter-electrode distance was set as 5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.6Pa of Kr gas **, MoW containing Mo of 65 atom % was made to deposit on a glass substrate, and the MoW alloy film (sample 2) of 300nm of thickness was formed. In addition, when Kr content in the film of this sample 2 was measured with fluorescence-X-rays equipment SYSTEM3271 (physical science electrician business company make, tradename), it was below 0.0003 atom %. Moreover, when the resistivity of this sample 2 was measured, it was 12micro ohm-cm.

[0020] Moreover, using the sputtering system with many oblique-incidence components, 30 degrees C and membrane formation power were set as 1kW, inter-electrode distance was set as 10cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.5Pa of Ar gas **, MoW containing Mo of 65 atom % was made to deposit on a glass substrate, and the MoW alloy film (sample 3) of 300nm of thickness was formed. In addition, Ar content in the film of this sample 3 was about 20 atom %. Moreover, when the resistivity of this sample 3 was measured, it was 50micro ohm-cm.

[0021] Moreover, using the sputtering system of the load lock formula of single wafer processing, 200 degrees C and membrane formation power were set as 10kW, inter-electrode distance was set as 5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.9Pa of Ar gas **, MoW containing Mo of 30 atom % was made to deposit on a glass substrate, and the MoW alloy film (sample 4) of 300nm of thickness was formed. In addition, Ar content in the film of this sample 4 was three atom %. Moreover, when the resistivity of this sample 4 was measured, it was 25micro ohm-cm.

[0022] Moreover, using the sputtering system of the load lock formula of single wafer processing, 200 degrees C and membrane formation power were set as 10kW, inter-electrode distance was set as 5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.6Pa of Kr gas **, MoW containing Mo of 30 atom % was made to deposit on a glass substrate, and the MoW alloy film (sample 5) of 300nm of thickness was formed. In addition, Kr content in the film of this sample 5 was 0.001 atom %. Moreover, when the resistivity of this sample 5 was measured, it was 13micro ohm-cm.

[0023] Furthermore, when the content of Ar in a film exceeded pentatomic % as a result of research of this invention persons, it turns out that resistivity increases rapidly. When this inclination is the same in general also about Xe or Kr and Xe in a film or the content of Kr exceeded 3 atom %, resistivity increased rapidly. Moreover, resistivity increased like the above that ten atoms 5 - 95 atom % had Mo in a film, and the content of W out of range.

[0024] Thus, when resistivity was taken into consideration, as for the addition of Ar in material, the addition of Kr found that it was desirable for the addition of Xe to be below 3 atom % below 3 atom % below pentatomic %. On the other hand, when there are few additions of Ar, Kr, and Xe than 0.0003 atom %, it is necessary to reduce membrane formation power in the case of membrane formation, and to make a sputtering rate late enough. Moreover, after forming membranes, it is necessary to make a

film component recrystallize. Therefore, when there are few additions of Ar, Kr, and Xe than 0.0003 atom %, it also turns out that it is completely industrially unsuitable.
[0025] Moreover, this invention persons made MoW containing Mo of 65 atom % deposit on a glass substrate using the sputtering system of the load lock formula of single wafer processing mentioned above, and got the MoW alloy film with which membrane formation conditions are changed, and are formed, and Ar contents in a film differ the MoW alloy film of 300nm of thickness. By making it increase as a result, for example, membrane formation power, a MoW alloy film with many Ar contents can be obtained, and a MoW alloy film with many [too] Ar contents can be obtained by making a membrane formation pressure small.
[0026] Drawing 1 is the property view showing the relation between stress, resistivity and the rate of film peeling, and Ar content in a film. In the point of stress and resistivity, it turns out that the property in which the content of Ar excelled within the limits of 0.0003 atom % - pentatomic % is shown. Moreover, when it sees about the rate of film peeling, there is an inclination for Ar content to increase in a field fewer than 0.4 atom %. Therefore, in the use which thinks especially membranous adhesion as important, it is desirable preferably to set up the content of Ar within the limits of 0.4 atom % - pentatomic %.
[0027] Moreover, this invention persons made MoW containing Mo of 65 atom % deposit on a glass substrate using the sputtering system of the load lock formula of single wafer processing mentioned above, and got the MoW alloy film with which membrane formation conditions are changed, and are formed, and Kr contents in a film differ the MoW alloy film of 400nm of thickness.
[0028] Drawing 2 is the property view showing the relation between stress, resistivity and the rate of film peeling, and Kr content in a film. Also in any of stress, resistivity, and the rate of film peeling, it turns out that the property in which the content of Kr excelled within the limits of 0.0003 atom % - 3 atom % is shown. Moreover, since simple reduction of the stress was not carried out but it was changed with increase of Kr content when the MoW alloy film which contains Kr using a different sputtering system was formed, about stress, it turns out that a device dependence is strong.
[0029] It sets up so that the alloying element chosen from the group which consists of Ar of 0.0003 atom % - pentatomic %, Kr of 0.0003 atom % - 3 atom %, and Xe of 0.0003 atoms - 3 atom % in the electrode wiring material of this invention may be included from the above thing. It may be independently mixed in the metal of the principal component of an electrode wiring material, and these alloying elements may be mixed and mixed. When mixing an alloying element and mixing, a membranous property turns into the property that change of the property of the film by addition of the alloying element of almost each was added.
[0030] Next, the membrane formation gas dependency and composition dependency of resistivity are explained with reference to drawing 3 . Drawing 3 is the property view showing the relation between resistivity and the content of Mo. 150 degrees C and membrane formation power are set as 2kW, inter-electrode distance is set as 5.5cm, respectively, and the substrate temperature before membrane formation is made to deposit in 300nm of thickness on a glass substrate into the atmosphere of 0.5Pa of gas ** of Ar, Kr, and Xe using the sputtering system of the load lock formula of single wafer processing with a small sample. In addition, each content of Ar, Kr, and Xe in each film was within the limits of this invention.
[0031] The direction with many contents of Mo can reduce resistivity more so that drawing 3 may show. Especially, in the membrane formation in Ar atmosphere, the direction constituted from Mo single phase can reduce resistivity. Moreover, in the membrane formation in Xe and Kr atmosphere, Mo could obtain the thing of low resistivity by within the limits below 80 atom % to the pan below 90 atom %, and the good result was obtained. Moreover, especially in the inside of Ar atmosphere, that it is also desirable shows forming membranes in Xe or Kr atmosphere, especially Kr atmosphere.
[0032] Drawing 4 is the property view showing the relation between the lattice constant measured by the X-ray, and the content of Mo. By forming membranes in Xe or Kr atmosphere, especially Kr atmosphere, a lattice constant becomes near with the lattice constant of a bulk state, and crystallinity becomes good from the inside of Ar atmosphere so that drawing 4 may show. Kr and Xe of atomic weight are fully large compared with Ar, and this is considered to be because for high energy to be given on the occasion of membrane formation. Thereby, low resistance-ization is attained. The difference with the lattice constant of a bulk state was actually that in which a less than 1.01-time film has low resistivity preferably less than 1.03 times.
[0033] Next, the dependency of the membrane formation conditions over a membranous property is explained with reference to drawing 5 - drawing 8 . Drawing 5 is the property view showing the relation between resistivity and membrane formation power, and shows the membrane formation power dependency of the resistivity in the atmosphere of 0.9Pa of gas **. Drawing 6 is the property view showing the relation between resistivity and gas **, and shows the gas ******** of the resistivity in membrane formation power 10kW. Using the sputtering system of the load lock formula of single wafer processing which mentioned above the sample in drawing 5 and drawing 6 , the substrate temperature before membrane formation is set as 200 degrees C, inter-electrode distance is set as 5cm, respectively, and the MoW alloy film which contains Mo of 65 atom % on a glass substrate is formed by 400nm of thickness into each atmosphere of Ar and Kr.
[0034] Moreover, the membrane formation power dependency of resistivity [in / 0.75Pa of gas ** / it is the property view in which drawing 7 shows the relation between resistivity and membrane formation power, and] is shown, drawing 8 is the property view showing the relation between resistivity and gas **, and the gas ******** of the resistivity in membrane formation power 2kW is shown. Using the sputtering system of small single wafer processing in which the sample in drawing 7 and drawing 8 differs from ****, the substrate temperature before membrane formation is set as 150 degrees C, inter-electrode distance is set as 5.5cm, respectively, and the MoW alloy film which contains Mo of 65 atom % on a glass substrate is formed by 300nm of thickness into each atmosphere of Ar and Kr.
[0035] The membrane formation in Ar atmosphere is comparatively small in membrane formation power, and low

resistance-ization is attained by setting up gas ** highly so that the experimental result mentioned above may show. Moreover, in the membrane formation in Kr or Xe atmosphere, the optimum conditions for there being a device dependence and making resistivity into the minimum exist.
[0036] Moreover, when investigated about the relation between thickness and resistivity, it turns out that membraneous quality will be stabilized by it if it exceeds 30nm of thickness, although 30nm of thickness had high resistivity a little, and fixed resistivity is shown.
[0037] Hereafter, the example of this invention is explained concretely, referring to a drawing.
(Example 1) Drawing 10 is the plan showing the drive circuit board (electrode wiring substrate) of a liquid crystal display which used the electrode wiring material of this invention. Drawing 9 is a cross section which meets the IX-IX line of drawing 10. In addition, in drawing 10, only the pad as electrode wiring and an electrode is shown. Moreover, it explains here focusing on the composition of TFT used and a storage-capacitance portion, and its process.
[0038] First, 101 in drawing 9 and 102 A glass substrate is shown. This glass substrate 101 Upwards the lower black matrix 18 is formed and the insulator layer 19 is formed on the black matrix 18. On the insulator layer 19, the gate electrode 1 of the Mo-W alloy which comes to extend from address wiring (a gate electrode and really formed) is formed. On the gate electrode 1, the semiconductor layer 4 and the stopper insulator layer 5 are formed through the insulator layer 7, and patterning is carried out, respectively.
[0039] This gate electrode 1 is formed as follows. First, glass substrate 101 It is a glass substrate 101 about MoW which lays in the sputtering system of the load lock formula of single wafer processing, sets 150 degrees C and membrane formation power as 10kW, sets inter-electrode distance as 5cm for the substrate temperature before membrane formation, respectively, performs sputtering using a MoW alloy target into the atmosphere of 0.5Pa of Kr gas **, and contains Mo of 65 atom %. It was made to deposit upwards and the MoW alloy film with a thickness of 300nm was formed. In addition, Kr content in this film was 0.001 atom %, and the lattice constant was 3.15A almost equal to a bulk state. As for the resistivity of this MoW alloy film, low resistance-ization was fully made with 13micro ohm-cm.
[0040] Subsequently, it is CF4 about this MoW alloy film. O2 Taper etching was carried out using mixed gas, and the gate electrode 1 of 35 degrees of taper angles was formed. In order to make good covering nature (coverage) by the gate insulator layer as a taper angle of a gate electrode, it is desirable preferably to make it the range of 25-50 degrees 20-60 degrees.
[0041] Subsequently, it is SiO2 on this gate electrode. And the semiconductor layer 4 which consists of an insulator layer 7 which consists of a layered product of SiNx, a-Si:H, etc., and the stopper insulator layer 5 which consists of SiNx are formed, and patterning is carried out, respectively.
[0042] Furthermore, on the above-mentioned composition, drain electrode 3a and source electrode 3b which consisted of aluminum or a Mo-W alloy are formed. The source drain field which consists of n type amorphous silicon is shown by the inside 30a and 30b of drawing 6. Thus, TFT17 is constituted and the pixel electrode 6 is connected to source electrode 3b of this TFT17. Thus, the liquid crystal drive circuit board 21 is constituted. in addition -- as the material of the pixel electrode 6 -- ITO and SnO2 etc. -- a transparent electrical conducting material can be used
[0043] A counterelectrode 20 is a glass substrate 102. It is constituted by forming upwards the black matrix 9 which consists of a light filter 8 and a Mo-W alloy, and forming on it the counterelectrode 11 which consists of ITO. This liquid crystal drive circuit board 21 and the opposite substrate 20 are made to counter, as shown in drawing 9, and a liquid crystal display is constituted by making the liquid crystal material 16 pinch among both.
[0044] Moreover, glass substrate 101 Upwards, two or more address wiring 1 which has the address electrode pad 13 which becomes an end from a Mo-W alloy, and these address wiring 1 of two or more are intersected, and two or more data wiring 2 which has the data electrode pad 16 which becomes the end from a Mo-W alloy is formed. In addition, in a part for the intersection of the address wiring 1 and the data wiring 2, the insulator layer is prepared between the address wiring 1 and the data wiring 2. TFT17 is formed in a part for this intersection as a switching element so that it may adjoin, and the pixel electrode 6 formed in the pixel field surrounded by the address wiring 1 and the data wiring 2 is connected to source electrode 3b which is the electrode of one of these. Moreover, the field of the address electrode pad 13 has the size which includes the address electrode 15 and a contact hole 14.
[0045] The liquid crystal display which has the above-mentioned composition does the following various effects so. That is, it is needed that it is low resistance as a screen becomes large-sized and wiring resistance becomes highly minute in the liquid crystal display using TFT. For example, on the display (VGA) for personal computers, wiring is 480x (640x3), and wiring is 760x (1024x3) in an upper PC monitor (XGA). The wiring resistance in this case needs to be low resistance in order to prevent delay of a gate pulse. Pulse delay is determined by the product CR with the capacity C of TFT added to the wiring resistance R and wiring, or a storage capacitance. If a screen is enlarged, since wiring becomes long, R will increase inevitably and CR will become large. Moreover, if the number of pixels increases, since C (C[C=C0 Xn and]0 : the capacity of a unit pixel, n:pixel number) increases, CR will become large. Since C is decided from a pixel, in order to prevent pulse delay, it is necessary to lower R.
[0046] In the usual process, in the usual design with the screen size more than the 10 inches class of diagonal, below 2540micro ohm-cm, 40micro ohm-cm and SVGA are and the resistivity of VGA below 20micro ohm-cm is required for XGA. For this reason, although resistivity can use usual Mo-Ta and Cr which are 40micro ohm-cm grade for the wiring material of VGA, neither Mo-Ta nor Cr can be used in XGA. However, in this example, in order to use low resistance Mo-W of Kr content which resistivity becomes below 20micro ohm-cm, it becomes possible to offer the high definition liquid crystal display of such VGA

and XGA specification.
[0047] Moreover, the address line formed in this example using the Mo-W alloy is CF4. O2 It turns out that taper processing can be given by CDE (Chemical Dry Etching) using mixed gas. Furthermore, the wet etching using the alkali etchant (pH 7-13) containing the oxidizer which has low oxidation reduction potential rather than Ti more highly than Mo and W showed that taper processing could be given, without giving degradation to a resist.
[0048] Therefore, according to this example, since a Mo-W alloy has low resistivity, the address wiring formed using this material can show low resistance, and, so, delay of the gate pulse by this wiring resistance can give the gate pulse which does not arise and does not have delay in a predetermined switching element.
[0049] Moreover, since a Mo-W alloy film can carry out taper processing, the step coverage of the layer insulation film which forms membranes on the address wiring formed using this material becomes good, and can secure isolation voltage highly. In addition, it is SiO2 in order to make taper etching easy. Although it is desirable to prepare a under-coat layer, a under-coat layer can be made unnecessary by selection of etching conditions etc.
[0050] Therefore, even if it is the case where a viewing area is large-area-ized, it becomes possible to realize a reliable liquid crystal display. Moreover, since wiring width of face can be made thin if the resistivity of address wiring becomes low even if it is not the display of a large area, there is also an advantage which can gather a numerical aperture.
[0051] Moreover, in the liquid crystal display which has the above-mentioned composition, since it is formed with the same Mo-W alloy as the gate electrode which also mentioned above the address electrode pad 13 and the data electrode pad 16, in the case of COG (Chip On Glass) mounting, the junction force between ICs for image signals connected at those electrode pad and this improves, and high reliability is acquired, for example.
[0052] Furthermore, a reflection factor is a low, and by using a Mo-W alloy as a black matrix material, a Mo-W alloy can reduce reflection of the light from the outside in an image display side, and can realize high-definition display quality.
[0053] Furthermore, as shown in drawing 11 , the chemical resistance of a Mo-W alloy excelled [content / W] in 25% - 90% very much preferably 20% to 95%, and it did not ********** at all to BHF which the etching rate to the ITO etchant of a pixel electrode material is 10 or less nm/min, and is etchant of a layer insulation film, and the etching rate was 30-400 or less nm/min to aluminum etchant. Especially, when W is 50% or more, it turns out that it is not invaded at all to each etchant. Therefore, when using the Mo-W alloy as various kinds of wiring materials, micro processing becomes possible and high definition liquid crystal displays, such as a display (VGA) for personal computers (wiring is 480x (640x3)) and a display (XGA) for upper personal computers (wiring is 760x (1024x3)), can be offered.
[0054] Moreover, according to the investigation of this invention persons with Mo-W and a near property about the etching property of Mo-Ti of Ar0.3 atom % content, as shown in drawing 12 , it turns out that the chemical resistance of the Mo-W alloy to BHF used for the ITO etchant used for formation of the pixel electrode 6 or contact hole formation is very excellent in 20 - 80% of Ti contents. Moreover, by using the weak alkali etchant (pH 7-9) containing the oxidizer which has oxidation reduction potential higher than Ti showed that **********ing without the dissolution of a resist was possible. Moreover, it turns out that the acid resistance excellent also in W-Ti is shown. Moreover, even if it carries out 5 atom % grade addition of Ta, Nb, Cr, Zr, and Hf other than Ti, the almost equivalent inclination was shown and it was checked that what carries out specified quantity content especially of Xe and Kr shows various kinds of good properties.
[0055] In addition, in this example, it turns out with large-sized equipment that 300 degrees C from a room temperature and power show [temperature] a film property sufficiently good on 3-20kW and membrane formation conditions while 1-4kW and a pressure are [0.3-1.2Pa and inter-electrode distance] 4-10cm with small equipment.
[0056] In the wiring in this example, in order to raise adhesion with a ground (substrate), it is desirable to carry out the laminating of the film which consists of a nitride of the Mo-W alloy of Ar content, and the film which consists of a Mo-W alloy. Among Mo-W alloys, especially about the film which consists of the following [W content 50 atom %], when it annealed in air, it turns out that resistivity rises by 1 or more figures. This is based on surface extreme oxidization. In this case, by carrying out the laminating of the film which consists of a nitride of a Mo-W alloy on it showed that oxidization was prevented and resistance did not go up. after [namely,] forming the Mo-W alloy of Ar content by sputtering -- N content -- the nitride of the Mo-W alloy below 50 atom % -- sputtering -- carrying out -- CF4+O2 it oxidizes by carrying out plasma etching by mixed gas -- having -- hard -- and -- low -- wiring [****] can be formed In this case, it can form in the same process as formation of a Mo-W alloy film. In addition, since resistance will rise rapidly if more nitrogen (N) than 50 atom % is contained in this case, it is necessary to hold down the content of N to below 50 atom %.
(Example 2) In the following examples, the same sign is given to the same portion as an example 1, and the detailed explanation is omitted for simplification.
[0057] In this example, different points from an example 1 are the liquid crystal drive circuit board and a wiring material. Drawing 13 is the cross section showing other examples of the liquid crystal drive circuit board of a liquid crystal display which used the electrode wiring material of this invention. This liquid crystal drive circuit board is explained focusing on the composition of TFT and a storage-capacitance portion, and its process. Glass substrate 101 Upwards the polycrystal Si film 104 with a thickness of 100nm is formed, and it is the gate oxide film 1073 with a thickness of 100nm on it. It is formed. Furthermore, on it, the gate electrode 102 which consists of a Mo-Ti alloy which does 0.1 atom % content of Ar is formed. This Mo-Ti alloy does 10 atom % content of Ti.
[0058] This gate electrode 102 is formed as follows. First, glass substrate 101 It lays in the sputtering system of the load lock formula of small single wafer processing. Are set 150 degrees C and membrane formation power as 2kW, and inter-electrode

distance is set as 5.5cm for the substrate temperature before membrane formation, respectively. It is a glass substrate 101 about the MoTi alloy which performs sputtering using a MoTi alloy target and contains Ti of 10 atom % in the atmosphere of 0.6Pa of Ar gas **. It was made to deposit upwards and the MoTi alloy film with a thickness of 300nm was formed. In addition, Ar content in this film was 0.1 atom %, and the lattice constant was 3.14A almost equal to a bulk state. As for the resistivity of this MoTi alloy film, low resistance-ization was fully made with 25micro ohm-cm.

[0059] On the above-mentioned composition, they are the source / drain section n+. The polycrystal Si layers 103a and 103b are formed, and the island-like polycrystal Si barrier layer 104 is formed. This is producible by pouring in Lynn by dose 1x1016cm-3 by using the gate electrode 102 as a mask. Furthermore, on it, it is the layer insulation film 1071 with a thickness of 300nm by Heat CVD. It is formed.

[0060] The pixel electrode 206 is formed in the pixel field by carrying out sputtering of the ITO and carrying out patterning by 100nm in thickness. furthermore, layer insulation film (SiOx) 1071 of the contact section and the gate section **** -- by **********ing using rare HF, the contact hole is formed and signal-line and source electrode (1st main electrode) 106a and drain electrode (2nd main electrode) 106b are formed by depositing the Mo-W alloy of Ar content by sputtering on it, and forming and carrying out patterning of the Mo-W alloy film with a thickness of 300nm Here, a Mo-W alloy does 60 atom % content of W.

[0061] This signal line etc. is formed as follows. First, glass substrate 101 It laid in the sputtering system of the load lock formula of small single wafer processing, 150 degrees C and membrane formation power were set as 3kW, inter-electrode distance was set as 5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.8Pa of Ar gas **, sputtering was performed using the Mo-W alloy target, and the Mo-W alloy film with a thickness [containing W of 60 atom %] of 300nm was formed. In addition, Ar content in this film was two atom %, and the lattice constant was 3.16A almost equal to a bulk state. As for the resistivity of this Mo-W alloy film, low resistance-ization was fully made with 13micro ohm-cm.

[0062] It is the passivation SiNx film 1072 by forming a SiNx film by plasma CVD on a TFT field, and **********ing a pixel and a circumference circuit connection by RIE. It is formed. Thus, the liquid crystal drive circuit board 110 is constituted.

[0063] When the liquid crystal display was produced like the example 1 and the same evaluation as an example 1 was performed using the liquid crystal drive circuit board 110 which has the above-mentioned composition, the liquid crystal display demonstrated the same effect in an example 1. Furthermore, the following effects were acquired. That is, since aluminum was conventionally used as a signal-line metal, they are ITO and n+. Although the barrier metal of refractory metals, such as Mo, needed to be prepared between Polycrystal Si, by using the Mo-W alloy which is barrier metal by low resistance as a signal-line metal, barrier metal was able to become unnecessary and, thereby, was able to cut down the process.

(Example 3) In this example, a different point from an example 1 is a wiring material containing the liquid crystal drive circuit board and a gate electrode. Drawing 14 is the cross section showing other examples of the liquid crystal drive circuit board of a liquid crystal display which used the electrode wiring material of this invention. This liquid crystal drive circuit board is n+ on a channel. TFT which has the structure which comes to ********** in amorphous silicon is used. Moreover, the storage-capacitance portion is formed by wiring of a gate electrode and the same layer as data wiring. This liquid crystal drive circuit board is produced as follows.

[0064] First, glass substrate 101 It is the gate electrode 1121 at Mo-W which is the wiring metal used in the example 1 upwards. Cs wiring 1122 It really forms simultaneously. About membrane formation of Mo-W, it carries out like an example 1. Subsequently, the layer insulation film 1173, the amorphous Si barrier layer 114, and n+ The amorphous Si layers 115a and 115b are formed one by one, and carry out patterning. Subsequently, source electrode 116a and drain electrode 116b are simultaneously formed with the above-mentioned wiring metal. Subsequently, it is an oxide film 1171 on it. It forms, a contact hole is formed on drain electrode 116b, and the pixel electrode 216 is further formed in a pixel field. In addition, this pixel electrode 216 and Cs wiring 1122 Auxiliary capacity is formed in between.

[0065] When the liquid crystal display was produced like the example 1 and the same evaluation as an example 1 was performed using the liquid crystal drive circuit board 110 which has the above-mentioned composition, the liquid crystal display demonstrated the same effect in an example 1. Furthermore, the following effects were acquired. That is, since it could etch by CDE in the manufacturing process, and resistance of the oxide film of Mo and W was low and ITO obtained good contact, barrier metal was not needed.

[0066] Here, in the example 1 mentioned above - an example 3, each component is not limited to the contents of each example. For example, you may use Polycrystal Si and not only amorphous Si but this middle microcrystal Si as a semiconductor material. Moreover, you may use compound semiconductors, such as CdSe and SiGe. Moreover, not only an oxide film but a nitride and an oxidization nitride may be used for the insulator layer formed on the data line. Furthermore, as a switching element, it is not limited to a transistor and MIM and diode can be used instead of the transistor of an example 1. Moreover, the electrode wiring material of this invention is also applicable to electrode wiring of a simple matrix liquid crystal display.

[0067] Furthermore, you may use the cascade screen in which the film which consists of an alloy which may use the alloy used in the above-mentioned example by the monolayer like each example, makes Mo and W a principal component in order to prevent the cascade screen more than two-layer [by the alloy with which composition differs], for example, scaling, and contains nitrogen was formed on the film which consists of a Mo-W alloy.

[0068] Moreover, the laminating of the metals, such as Ta, Ta-N, Ta-Mo, Ta-Nb, Ta-W, Ta-Nb-N, Ta-Mo-N, Ta-W-N alloys, or these alloys, may be carried out to the front face of the above-mentioned Mo-W alloy film explained in the above-mentioned example, i.e., the upper layer of a Mo-W alloy film, and acid resistance may be raised. Furthermore, the film which becomes the

lower layer of the above-mentioned Mo-W alloy film from aluminum, Cu, Au, etc. may be prepared, and resistance may be lowered further.
[0069] Moreover, this invention is not limited to each example mentioned above, it is the range which does not deviate from the summary, and can deform variously and can be carried out.
(Example 4) Drawing 15 applies the MoW alloy film which did 0.2 atom % content of Ar and Kr to the MOS transistor of DRAM.
[0070] The concrete composition of this DRAM is as follows. 41 in drawing shows the single crystal substrate of Si. n+ which is an impurity diffusion field at the single crystal substrate 41 Fields 45a and 45b are formed. On the single crystal substrate 41, it is the LOCOS silicon-oxide film 473. It is formed. Moreover, LOCOS silicon-oxide film 473 Upwards, the gate electrode 42 which consists of a MoW alloy is formed.
[0071] This MoW alloy film is formed as follows. First, the single crystal substrate 41 was laid in the sputtering system of the load lock formula of small single wafer processing, 150 degrees C and membrane formation power were set as 2kW, inter-electrode distance was set as 5.5cm for the substrate temperature before membrane formation, respectively, into the atmosphere of 0.3Pa of Ar gas **, and 0.5Pa of Kr gas **, sputtering was performed using the MoW alloy target and the MoW alloy film with a thickness [containing W of 35 atom %] of 300nm was formed. The lattice constant was 3.16A almost equal to a bulk state. As for the resistivity of this MoW alloy film, low resistance-ization was fully made with 15micro ohm-cm.
[0072] The silicon nitride 40 is formed on the gate electrode 42, and it is the field oxide film 471 on it. It is formed. field oxide film 471 **** -- the contact hole which arrives at the n+ fields 45a and 45b is formed, and aluminum source drain electrodes 46a and 46b are formed in the contact hole
[0073] in addition, DRAM -- setting -- the gate electrode 42 -- Polycrystal Si and MoSi2 etc. -- although formed by silicide, pulse delay becomes a problem when 1-5ohms / **, and sheet resistance use as a wiring material between the word lines of DRAM highly On the other hand, if the gate electrode 42 and a word line (not shown) are formed with the MoW alloy of the same Ar content as what was used in the example 1, about 1 figure can be formed into low resistance with 0.3ohms / **. Moreover, since the MoW alloy is excellent in thermal resistance, low resistance, and acid resistance, it fits wiring of a gate line, a word line, etc., and can offer DRAM excellent in rapidity. Here, it can be used as a pad electrode in addition to wiring.
[0074] In addition, it cannot be overemphasized that the electrode wiring substrate of this invention cannot be restricted to DRAM, and it can apply to other LSI, such as ASIC. Moreover, it is applicable also to SRAM as semiconductor memory equipment. Especially, about an electrode, it is applicable with the same material as the address line of an example 1 as gate electrodes, such as a power element (gate turn-off thyristor), for example, GTO, IGBT (in SHURETEDDO gate bipolar transistor), and a thyristor, and a drawer electrode from a semiconductor layer.
[0075]
[Effect of the Invention] As explained above, since the electrode wiring material of this invention contains the alloying element chosen from the group which makes a principal component at least one sort chosen from Mo and W, and consists of Ar of 0.0003 atom % - pentatomic %, Kr of 0.0003 atom % - 3 atom %, and Xe of 0.0003 atom % - 3 atom %, it fully has low resistivity and, moreover, is easy handling.
[0076] Moreover, in the electrode wiring substrate which comes to form electrode wiring on a glass substrate, the aforementioned electrode wiring consists of at least one sort of metals chosen from Mo and W, and since the electrode wiring substrate of this invention has the lattice constant of the material in the aforementioned electrode wiring almost equal to the lattice constant of the bulk state of the aforementioned material, it is reliable.

[Translation done.]